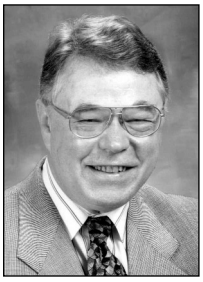
Foresight: the US Environmental Protection Agency

Institute of Alternative Futures, Environmental Protection Agency



Offices throughout the US Environmental Protection Agency (EPA) have engaged sporadically over the years in efforts to improve environmental foresight, but only limited progress has been made. In fact, none of the efforts undertaken to date have had a significant impact on agency-wide priorities or strategic plans. To begin to address the need for consistent, agency-wide foresight activities, the Office of the Chief Financial Officer (OCFO) established a staff level futures network in September 1999. **Bob Olson** and **Anita Street** outline the project.

In its 1995 report, 'Beyond the horizon', the EPA's science advisory board issued a call for improving the agency's capacity for environmental foresight. It challenged the EPA:

> *"To begin to anticipate future environmental problems, and then take steps to avoid them, not just respond to them after the fact."*

It urged the EPA to establish an ongoing early-warning system to identify potential future environmental risks, and to change its priorities over time so that eventually, as much attention should be given to avoiding future environmental problems as to controlling current ones.

'Beyond the horizon' was a call for a fundamental shift in approach to the whole enterprise of environmental protection. Virtually all of today's environmental institutions, laws and regulations arose as a reactive catch-up effort to deal with unanticipated problems that were already having serious impacts on human health and the environment by the time they came to the attention of policy makers.

Past foresight efforts

Almost from EPA's inception, there have been scattered and sporadic efforts within the agency to explore the use of scanning, scenarios and visioning exercises for environmental foresight. One of the earliest initiatives was in 1975 when EPA's Office of Pesticide Programs commissioned the Center for the Study of Social Policy at SRI International to prepare the report 'Alternative Futures for Environmental Policy Planning: 1975-2000'. In retrospect, this study pioneered important new methods and images of the future, but it is unclear if it had any direct impact on policy and planning within the pesticides program.

The largest single foresight initiative was the establishment in the early 1990s of a formal futures studies unit in the former Office of Policy, Planning and Evaluation. Innovative EPA programmes such as 'Energy Star' were born from the groundbreaking work of the futures unit. It helped organise greater intergovernmental cooperation to promote environmentally advanced technologies, and supported the science advisory board's environmental futures committee in producing the report.

Several new foresight efforts have been initiated since the publication of 'Beyond the horizon'. Projects of various kinds have been undertaken by several offices within the agency, including the Office of Radiation and Indoor Air, the Office of Research and Development, the Office of Human Resources, the Office of Emergency and Remedial Response and the Office of International Activities. While these efforts have produced credible results and helped give legitimacy to futures work, they have all been sharply limited. They were 'one shot' activities rather than part of an ongoing, systematic foresight process. They occurred in isolation from each other, with little sharing of results or lessons of experience. They had only minor impacts on the priorities of senior agency executives, and no discernable impact on the agency's strategic planning.

The 'futures network' strategy

In September 1999, the Office of the Chief Financial Officer (OCFO), which co-ordinates the EDA's strate-

gic planning process, launched an effort to create an agency-wide futures network. OCFO contacted senior career executives in different parts of the agency and asked them to appoint program and regional staff who have planning responsibilities or a particular interest in futures analysis to work within the futures network to promote environmental foresight.

The success of the effort hinged on the network members' ability to serve as legitimate 'ambassadors' from their offices to the network, and from the network back to senior career executives and colleagues within their offices. The hope was that the network could help overcome some of the limits of past efforts by stimulating futures analysis throughout the agency, promoting capacity-building, helping people share information across organisational boundaries, and keeping the agency's senior career executives aware of and involved in foresight activities.

The first step: scenario training

After establishing the futures network, the OCFO team convened several meetings over a three-month period to better define the network's objectives and develop a work plan. The team quickly decided that basic training in building scenarios would be a good way to familiarise network members with futures methods and to lay the foundation for a consistent approach to futures analysis.

OCFO allied with the ORD to sponsor a three-day intensive training for 30 members of the network. To conduct this training, OCFO brought in the Global Business Network (GBN), a leader in the field of corporate scenario planning. The training demonstrated to participants how scenarios can be developed and used as planning tools, and allowed them to practice some of the steps of building scenarios around environmental issues.

The following spring, OCFO organised a follow-on, one-day workshop for Network members. The Institute for Alternative Futures (IAF), a leader in scenario planning with public and nonprofit organisations, was brought in to train network members in scenario interviewing techniques and assist throughout the scenario development process. The strategy was to use the network to interview agency senior executives on their assumptions about the future of the environment and the agency's evolving role in environmental protection. The goal was to identify topics the agency's leaders believe are worth exploring further through the use of scenarios. The workshop also featured presentations demonstrating how scenarios have been used successfully as a practical planning tool. For example, a panel of managers from the US Department of Transportation (DOT) shared their perspective on the scenario development process they had recently completed and how the resulting scenarios were used in strategic planning.

The hope was that the network could help overcome some of the limits of past efforts by stimulating futures analysis throughout the agency

Involving senior executives: interviews and feedback

During April and May 2000, network members used a standard form developed by the IAF to conduct 34 interviews with senior executives representing nine headquarters and nine regional offices. In June the results of these interviews were presented to senior managers at a futures session preceding the EDA's annual planning meeting.

Many participants in this meeting were surprised to find that their personal views about the need for change in the agency were more widely shared than they had realised. For example, while three quarters of the survey respondents felt that the state of the US environment would probably be the same or better 20 years from now, the same proportion believed the global environment would be worse, perhaps much worse. This led to extended discussion of the need to expand the EPA's roles in responding to global environmental problems and assisting developing nations.

Media-based (air-water-land) legislation and organisational structures have made it difficult to develop integrated approaches to environmental problems, but over 90 per cent of the respondents said that EPA will have a stronger emphasis on multi-media or cross-media approaches 20 years from now than it does today. The discussion made it clear that participants believe the walls between what are often referred to as the agency's organisational 'silos', 'stovepipes' or 'fiefdoms' must become more permeable to make possible further major improvements in environmental protection.

The greatest area of uncertainty that emerged in the interviews was about whether public support and approval for EPA's work would increase or decrease over the generation ahead. Only about a third of the respondents said public support would become stronger. Many expressed uncertainty, and several worried that public support could erode.

From the dozens of possible topics mentioned in the interviews that could be addressed in building scenarios, the senior executive group winnowed the list by grouping like ideas and applying three selection criteria:

1. Agency-wide relevance;
2. High potential impact on human health and/or the environment;
3. A high level of uncertainty about what the future holds.

Creating a scenario development team

In July 2000, OCFO formed a scenario development team, a sub-group of the existing futures network. OCFO solicited volunteers to conduct research and define the axes around which to build the scenarios. After carefully considering the issues of concern raised by senior managers during interviews, the team identified several topics for further research:

- Aquifer depletion/water quality;
- Sprawl (including non-point source pollution and biodiversity loss);
- Biotechnology and nanotechnology;
- Chemicals in the environment (specifically, chemicals or sets of chemicals for which associations between exposure and effects are difficult to ascertain, and where there may be synergistic and cumulative effects of low exposures);
- Existing persistent environmental problems that may surprise the EPA as a result of changes in societal drivers; for example, an ageing population leading to mass migrations resulting in areas currently in

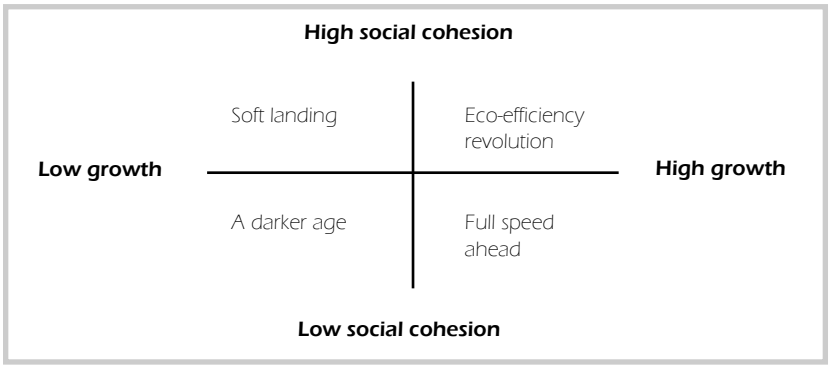


Figure 1 **Framework for building scenarios**

compliance being in violation of national air quality standards;
- Climate change.

The scenario team thought it important to choose a mix of topic areas that included issues that are global in scale, issues that were not on the EPA's radar screen, and some conventional persistent problems that are steadily worsening. An issue paper was developed on each of these topic areas. Each issue paper included an overview describing the general nature of the problem, trend data, the range of views on how the problem might change between now and 2020, and environmental and human health implications. The most important findings, or 'nuggets', fed into the scenarios.

Two axes for framing scenarios

The scenario team then set out to select two axes to serve as a framework for building the scenarios (see *Figure 1*). The chosen axes, economic growth and social cohesion, were selected to highlight social dynamics that have a profound effect on the environment but are often not considered in EPA policies and decision making.

The economy axis was defined in terms of growth or decline in the total production and consumption of goods and services. This is what GDP measures in national economies, and what gross world product (GWP) measures at the level of the world economy. At one end of the economy axis there is high growth in both US GDP and GWP. Towards the other end of the axis, growth rates slow or even become negative.

The social cohesion axis was defined in terms of the extent of shared values, mutual trust, inclusiveness of participation and willingness to face common challenges and co-operate in meeting them. Cohesion also requires a shared commitment to fairness, because extreme gaps between rich and poor, and other forms of social injustice undermine mutual trust.

At one end of the social cohesion axis, most individuals, communities and organisations are aligned around shared environmental values and committed to the importance of environmental protection. The different actors within society are willing to co-operate with each other and support government action to meet widely recognised environmental challenges. Toward the other end of the axis, society is increasingly fractionalised. Many people are indifferent or hostile to environmental values or refuse to recognise the seriousness of environmental challenges. Economic inequities, social conflicts, and practices that exclude people from participation create distrust and limit society's ability to cooperate in meeting challenges.

Four scenarios of the environmental future

These two axes intersect to create four quadrants representing four possible alternative futures or scenarios that were entitled: 'Eco-efficiency revolution', 'Full speed ahead', 'Soft landing' and 'A darker age'.

To flesh out the scenarios, the team engaged in an exercise using interconnected computers and groupware that allowed everyone to brainstorm ideas simultaneously and anonymously, and comment on each other's ideas. The writers for each of the scenarios mined this computer-enhanced brainstorming session to add specificity and realism to the basic scenario plots. Each scenario was then written as a three to four-page narrative. The narratives were entitled: 'Eco-efficiency', 'Soft-landing' and 'A darker age'.

It is important to be clear that these scenarios are not predictions. They are simply alternative stories of how the future might unfold: stories that compile information about divergent trends and potential developments into internally consistent images of plausible alternative futures. The four scenarios are not equally likely, although scenario team members believe they are all within the realm of plausibility. They were designed to span the full range of potential future conditions. The actual future is not likely to match with any one of these four images, but it will probably fall somewhere within the 'possibility space' that the scenarios explore.

The future is inherently uncertain. The scenarios force us to face that uncertainty, but they also make the uncertainty easier to think about by bounding it within a small number of explicit stories. This makes possible a level of strategic thinking, strategic conversation, and strategic planning that is more sophisticated than activity based only on the momentum of business-as-usual or on implicit and unexamined assumptions about the future.

Strategic conversation using the scenarios

In October 2000, in conjunction with a meeting of the EDA's reinvention action council, EPA senior career executives met to engage in a 'strategic conversation' based on the scenarios. The goal of the meeting was to encourage an open, honest exchange of ideas and opinions about possible future scenarios and to examine the agency's current directions in the light of these potential futures. No budgets were at stake, and no decisions were needed. The whole point was to set aside pressing business and talk together about issues and aspirations that may be important over the generation ahead.

Figure 2 **EPA senior executives ballot results**

	Desirability	Likelihood	Severity
Eco-Efficiency Revolution	60%	23%	17%
Full Speed Ahead	6%	45%	32%
Soft Landing	32%	17%	13%
A Darker Age	2%	15%	38%

To prepare for the meeting, the senior executives were asked to read the scenarios in advance and to identify for each scenario at least three implications for EPA. Each participant was also asked to cast a ballot allocating points (totalling 100) to reflect their assessment of the desirability, the likelihood of occurrence, and the relative severity of environmental impacts of each scenario. When the group met, participants shared their views on implications of the scenarios while their ballots were being tabulated (see *Figure 2*). The ballot results were reported back to the group, which then discussed the challenges the agency may face in the future and changes in the agency's current directions that may be necessary to meet those challenges.

The group was somewhat divided in its views about which scenario was most desirable. Some believed the 'Soft landing' scenario, with its slowdown of economic growth, would do the most to relieve pressures on the environment. But the majority favoured the 'Eco-efficiency revolution' scenario where rapid growth makes it possible to invest heavily in an advanced technological infrastructure far more efficient than today's in the use of energy and resources, with far lower environmental impacts per unit of GDP. Several participants noted that this scenario cuts through the traditional 'Growth versus limits to growth' debate by exploring possibilities for changing the character of growth.

The 'Full speed ahead' scenario was seen as most likely, largely because it comes closest to reflecting current trends as well as the underlying assumptions and preferences of many leaders in business and government. Many in the group were surprised to find, however, that their collective assessment was that while this is an appealing scenario in the short run, it is a destructive and negative scenario in the long run, with impacts nearly as severe as the most gloomy future, 'A darker age'. The group was therefore confronted with a disturbing conclusion from their own assessment of the scenarios: what they believe to be the most likely future, and the future that many government policies are geared towards promoting, is very different from what they believe is the preferred future that they would like to help create.

Eco-efficiency revolution (high economic growth and high social cohesion)

- 'Remediable crises' become turning points, changing the character but not the pace of growth.
- Energy price increases during the 2000s make energy a major issue.
- Fuel cells proliferate for power generation in 2000s; fuel cell cars come on the market in the later 2000s. In 2010s, ultra-light 'hypercars' flourish, running directly on hydrogen. Wind and solar power grow rapidly.
- In late 2000s, a water crisis threatens China's stability. UN Asian Water Initiative recommends changes related to water efficiency, water resource development, deforestation, desertification, climate change. China embarks on all-out effort to implement these recommendations.
- The idea of 'eco-efficiency' is popularised globally by the rapid spread of more efficient, cleaner energy technologies and China's successful response to its water crisis.
- In the 2010s, an eco-efficiency design revolution affects energy production and use, the chemical industry, manufacturing, construction, and transportation
- 'Greening of the private sector' as eco-efficiency proves highly profitable. High economic growth is focused on investment in a more environmentally advanced technical infrastructure.
- Environmental protection increasingly focuses on a larger strategy of sustainable development, including technology research and development, improved science, coordination across agencies and levels of government, partnerships with private sector, open information access, innovative approaches to public dialogue.
- The US plays and international leadership role promoting shift to eco-efficient technologies.
- WATER – Extensive adoption of water-efficiency technologies.
- CHEMICALS – Rapidly increasing production, but shift toward 'green chemistry'.
- SPRAWL – Hypercars encourage continuation of sprawl, fragmenting ecosystems.
- BIO/NANO TECH – 'Biotechnology soft path' emerges, not a rejection of biotech.
- CLIMATE – Emissions reduced by shift toward higher energy efficiency, fuel cells, renewable energy, with positive economic impacts.

The discussion of how to bridge this gap between the scenarios seen as most likely and most preferable surfaced a wide range of ideas about changes that may be needed in EPA's strategic direction. Some (not all) of the potential changes discussed by the group are summarised in the *Figure 3* and the associated quotations taken from the meeting notes.

Next steps

Progress has been made towards developing a capacity for better environmental foresight within the EPA

Currently, EPA has embarked on a new effort to consider how the agency manages for improved results. To guide this effort, OCFO has assembled a managing for improved results steering group. The steering group is examining EPA's strategic planning, priority-setting, budgeting and accountability structures and processes to identify potential improvements and to develop a change strategy. With strategic planning as one major focus for this effort, the steering group could likely recommend that futures thinking be a consideration in the development of the next strategic plan revision.

To improve the level of co-operation and collaboration between federal agencies, OCFO and ORD are working with IAF and the Woodrow Wilson International Center for Scholars (WWIC). WWIC, a non-partisan institute for advanced study, has created a foresight and governance project designed to "facilitate better foresight and long-term thinking in the public sector". Together the EPA, IAF and WWIC have held two federal futures practitioners roundtables bringing representatives of several agencies together to share information and initiate collaborative projects. These activities will continue on a regular basis.

Most recently, OCFO supported the work of the National Advisory Council for Environmental Policy and

Full speed ahead
(high economic growth and low social cohesion)

- The global 'long boom' is still going strong in 2020, with info-tech the critical catalyst.
- The information revolution becomes an across-the-board technology revolution as it transforms every other area of technology, from genomics to manufacturing.
- A breakthrough to molecular nanotechnology and nanomanufacturing occurs late in the 2010s.
- Market-oriented policies around the world accelerate economic globalisation.
- Integrated transnational corporations emerge and merge on a global scale. By 2020, a handful of economic giants dominates the world's increasingly borderless economy.
- Large transnationals sometimes play countries off against one another with little regard for health and environmental impacts on people in weaker countries; but they also serve as efficient conduits for transferring technology, capital, and expertise.
- Not everyone benefits from growth. Rich-poor gaps widen sharply within and especially between nations. Economic disasters befall nations that resist globalisation. Dysfunctional nations in Africa, the former Soviet Union and Asia are left behind.
- Huge increases in the use of energy, materials, and water have significant environmental impacts but receive little attention given the focus on growth and the promise of nanotechnology.
- WATER – Supply-oriented approach, huge infrastructure costs, growing conflicts.
- CHEMICALS – Rapidly increasing production, with new chemicals introduced too fast for adequate testing. Production increasingly shifts to locations closer to major new overseas markets, where there are growing health and environmental impacts, and novel problems from chemical interactions.
- SPRAWL – Continues unabated with loss of wetlands, ecosystem fragmentation, other impacts.
- BIO/NANO TECH – Regulatory process fails to keep up with new biotech products; significant problems emerge such as gene transfer and phenotypic surprises, loss of biodiversity in food crops; nanotechnology offers high promise but poses novel risks of serious accidents and malicious misuse.
- CLIMATE – Rapid growth in energy/fossil fuel use leads to rapid rise in CO2 concentrations; measurable impacts occur in areas such as loss of tundra, extreme weather events.

Soft landing
(low economic growth and high social cohesion)

- Rapid growth through most of 2000s with global information infrastructure coming into place.
- An economic slowdown occurs at the end of the 2000s, with further slowing in the 2010s.
- Initially, there is high frustration at our inability to halt or reverse the slowdown.
- Over time, an understanding grows that the slowdown is caused by unchangeable realities.
- Ageing populations in industrial nations reduce investment as elders spend down savings, as younger workers are heavily taxed to support retired elders, and as working age populations shrink.
- Many developing nations struggle to keep up with rapid population growth and the massive challenges they face of housing construction, infrastructure development, public health and education.
- Global oil production peaks in 2010s and begins to decline; there seems no escape from higher prices.
- During the 2020s, a realisation spreads that this gradual slowdown has a positive side. Environmental impacts drop with slowing energy consumption and resource use. The slowing pace reduces stress, and family and community strengthen.
- Global growth 'rebalances' as many developing nations with lower wages attract investment.
- Rising energy prices make it practical and necessary to improve energy efficiency; less money is available, but economic pressures to invest in efficiency are unrelenting.
- Global 'cyberactivism' emerges as a major force in the evolution of global governance. Computer language translation dramatically enhances transnational citizen activism. Key goals of activists include helping nations most in need, protection of the global environment, democratisation of emergent global institutions, and monitoring and regulation of transnational corporations.
- WATER – Greater efficiency of use; access to freshwater recognised as a human right; more careful communal decisions about development of water resources.
- CHEMICALS – US chemical production declines; greening of domestic manufacturers serves as model for developing world, but decreasing resources available for R&D, cleanup, science on impacts.
- SPRAWL – Sprawl abates; smart growth emerges as new ideal with more clustering of growth and transit-oriented development.
- BIO/NANO TECH – Promise of genetically engineered crops remains unfulfilled; more organic and ecological approaches in agriculture.
- CLIMATE – Rise in greenhouse gases slows with lower growth.

Technology (NACEPT), a citizen advisory group to the administrator of the EPA. In its January 2002 meeting, the NACEPT Council presented the administrator with its report on 'The Environmental Future: Emerging Challenges and Opportunities for EPA'. The council emphasised the need for EPA to develop and implement a "comprehensive, continuous and institutional futures scanning process to identify emerging trends and issues". At the council meeting, the ORD made a presentation on the environmental scanning project it is undertaking, which could evolve into the kind of comprehensive and continuous scanning process that NACEPT report advocated.

Some lessons of experience

Progress has been made toward developing a capacity for better environmental foresight within the EPA. We believe the strategy of developing a futures network that reaches throughout the agency and has strong links to its senior career executives is highly worthwhile. It is a strategy that can be pursued in other government agencies and institutions concerned with environmental protection. However, this progress is still incomplete and fragile and could easily be lost. Proponents of environmental foresight in the agency will need to work with senior leadership to gain their support and appreciation for the value of futures thinking, strive to secure sufficient resources for the agency to seriously engage in futures work, and promote the development of a culture of incentives and consequences to encourage foresight in planning. **SSP**

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1. Dispense with day-to-day activities that others can do in order to focus EPA's attention on higher priorities.
   "The scenarios make you realise that things we do today (like permitting) should go to the states, so that the EPA can elevate its attention to higher priorities."
2. Take on a stronger role in promoting environmental technologies.
   "We need to stimulate heavy investment in environmental technology now, 'while things are good'."
3. Increase EPA's global involvement and international leadership.
   "We need to achieve greater domestic consensus, elevate the agency's international leadership… and help create incentives for the private sector to help developing countries adopt environmentally superior technologies."
4. Expand information and outreach activities.
   "Connect what we do – the EPA's programs – to people… localise global issues for people so they can understand and respond."
5. Emphasise the importance of research for the EPA's overall effectiveness.
   "The biggest threat to the EPA is our limited ability to measure impacts and articulate risks. Unless we can do this better, people won't invest in environmental protection."
6. Coordinate environmental solutions across institutions.
   "Solutions to environmental problems require more coordinated action across government departments. EPA should take the lead in defining coordination needs… state and federal roles need to be better integrated… make more use of partnerships to achieve goals."
7. Working with congress, move towards multi-media, whole-system approaches to environmental protection.
   "Establish greater legislative flexibility for dealing with environmental problems."

Figure 3 **Changes in the EPA's strategic direction**

Disclaimer
Although the research described in this article has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement 68-W98-207 to Industrial Economics, Inc. (Institute for Alternative Futures), it has not been subjected to the agency's peer and administrative review and therefore may not necessarily reflect the views of the agency and no official endorsement should be inferred.

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A darker age

- Warning signals emerge in the 2100s: lingering recession, incidents of international terrorism, instability in the Middle East, soaring oil prices, tightening global grain prices as China imports more, evidence that the 1990s Asian financial crisis was never really resolved, turmoil in Russia and China, and more.
- Nervousness about all these factors leads some investors to pull out of the market; big institutional investors follow suit, and in 2005 global stock markets crash.
- Crashing stocks set off a chain reaction of protectionist actions and negative economic and social events, which acted to prevent an economic recovery.
- In the US and other industrial nations, economic strains worsen sharply as Baby Boomers retire.
- In developing nations, large numbers of people are thrown back into grinding poverty.
- Rage grows against the world's rich, catalysing a large increase in terrorism, including bioterrorism.
- Large numbers of newly desperate people and environmental refugees try to enter the US.
- Many social problems worsen, including a politics of blame, growing intolerance, a narrowing sense of community, an accelerating spread of AIDS and other new plagues.
- Some environmental impacts ease with slowing growth, but others worsen; loss of some hard-won progress on such basic environmental improvements as air and water.
- WATER – Worsening quality, aquifer contamination, waterborne diseases, conflicts over access
- CHEMICALS – Slowdown in production but declining regulation.
- SPRAWL – Slows with the economy, significant deterioration in inner cities.
- BIO/NANOTECH – Progress derailed by recession, adverse effects receive little attention.
- CLIMATE – Greenhouse gas emissions continue to rise but slow with lower growth; no transition to superior technologies; tropical disease vectors advance in latitude.